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The technology prescription: linking telecare and informatics by using a need-led paradigm

S. Levy, D.A. Bradley and
M.T. Swanston

This paper summarizes a current study examining the availability, appropriateness and acceptability of a technologically dependable healthcare provision to both service users and staff. An interface between the Electronic Patient Record (EPR) and future home care technology (Telecare) is suggested in the form of a 'technology prescription'. It is argued that appropriately prescribed technology will enable people to benefit from a modern, evidence-based service, which promotes a proactive means of addressing and preventing future health and care needs. The paper argues that technological innovations in care must not be perceived as a threat to the partnerships necessary in achieving maximum health gains, but rather be an aid to a patient centred clinical encounter.

Keywords
Informatics, telecare, telehealth, technology prescription

INTRODUCTION

The UK National Health Service (NHS) was created in 1948 to provide free, comprehensive and universal healthcare to all sections of the British public. This service was to be delivered in a rational way through the effective central management of demands for healthcare enabling efficient, yet fair, distribution of national resources. The overall aim of this service was to improve the health of the nation by facilitating access to care through need rather than an ability to pay. The government of the time also pledged that the NHS would have a continuing commitment to the equity and quality of health-

care services. However, while the initial assumption of the NHS visionaries was that improved access to healthcare services would reduce central government spending on healthcare, the reality proved this assumption to be a naïve hypothesis. Indeed, though more people received care before they required expensive treatment, as more healthcare was provided, so new needs emerged.

In recent years, the cost of healthcare provision has escalated with the growth in clinical knowledge and the introduction of new medical technologies. These advances extended the range of illnesses the NHS could diagnose and treat at the same time as expanding its preventative capability. At the same time, demographic and social changes have also increased the numbers of older people requiring care, while consumerism in healthcare has increased public expectations of the kind and level of services delivered. These changes have had a major impact on the publicly funded NHS which ever since 1948 has had to continuously redefine the concept of a free healthcare service. Moreover, the ability of the system to adequately respond to patients' needs is being continually questioned, leading Jones [1] to argue that the language used in recent policy papers is a political, need-based rhetoric rather than a guiding principle for a service concerned with the wellbeing of its users.

In an attempt to adhere to the original guiding principles, the UK healthcare system underwent a major transformation in the early 1990s from being an 'institution-centred/provider-focused' system to a 'community-based/client-centred/need-led' service. Such a change was essential to enable the healthcare service to operate in the 'information age' of the twenty-first century [2], in which the empowered patient/client is increasingly assuming responsibility for decisions relating to their own health and care provision. Recent White Papers [3][4] have heralded a new direction to the management of change within the health service with a shift from reorganization of services through alterations to the system's infrastructure to an emphasis on maximizing the utilization of information in the pursuit of effective and efficient services to be offered to the public.

A new period of change, referred to as the 'integrating technical period' [5], is now under way in which the government is aiming to identify and implement appropriate policies aided by innovative tools to support a health service 'fit for the twenty-first century'. This paper focuses on one possible innovative information-based tool which, if developed and supported by appropriate implementation policy, could be used in addressing the healthcare needs of an ageing population. The anticipated

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outcome of the application is to enable older people to stay at home for as long as it is desirable and safe for them to do so, while benefiting from preventative care designed to address their lifelong needs.

An interface between the Electronic Patient Record (EPR) and future home care technology (Telecare) is suggested in the paper in the form of a 'technology prescription'. The procedural progression of the associated technology assessment will bind the EPR to developments in 'Smart Homes' and other technologies to support a needs-led solution to future home care provision.

INFORMATICS AND EVIDENCE-BASED HEALTHCARE

Healthcare is an information intensive industry requiring clinicians to process the large amounts of information necessary to high quality, evidence-based clinical decisions. Such decisions are the end product of a care practice which must begin with the art of human engagement by way of meaningful (goal-directed) communication (information exchange) with patients, their families and other members of the multi-disciplinary care team. A 'human-centred' approach to care also incorporates non-verbal activities where a clinician studies patients' records, adding observations and planned treatment to these, monitors instruments that report on the patient's condition, performs tests or reviews the results of tests performed by others.

Levison [6] affirms that very little occurs in the clinical encounter that is not in some way related to processing data and information or applying derived knowledge. The clinician in information age healthcare: '...acquires, processes, stores, retrieves and applies information related to: (1) individual patient history and clinical course; (2) diagnostic and therapeutic protocols; (3) disease patterns in patients population; (4) functioning of the healthcare system and (5) the vast store of published knowledge'; Gorman [7] suggested a taxonomy of healthcare information using five generic categories namely:

- patient data
- population statistics
- bio-medical knowledge
- logistic information
- social influences.

Healthcare information used by clinicians currently comes primarily in a textual format (including electronic text) through: books,

(e)journals, reports, policy documents, circulars, guidelines, letters/email and clinical notes. Complementary numerical information illustrates factors such as population statistics, epidemiological reports, survey analysis and so forth. The competent care provider is attempting to process information in accordance with corporate/statutory/professional guidelines while at the same time performing the associated verbal and non-verbal activities. However, while such clinical multi-tasking ensures that the patient is informed at every stage of the care process, giving them an opportunity to take active part in their care, this clinical practice may create an information overload by presenting the participants with an overwhelming amount of information. It has been estimated that 'to keep up with current medical knowledge and information, the dedicated doctor would need to read 17 articles a day every day of the year.' [8]. There are now calls from within clinical areas for the use of new and specialized information management tools to aid healthcare providers' unmet information needs and assist in the process of managing clinical information demands which often exceed the cognitive capacity of clinicians [9].

Roberts [10] claims that all too often information in care is seen as a challenge to practice rather than an asset in promoting good clinical management and the means to support clinical audit, teaching and research. Beven noted that within the NHS: 'the information you have is not what you want. The information you want is not what you need and the information you need is not available' [11]. This information mismanagement affects the quality of care offered to patients by clinicians who lose precious patient-contact time in pursuit of needed yet unavailable information. Such ineffective use of clinical staff time has cost implications as noted in the 1995 Audit Commission study [12] which found that 15 per cent of a hospital's budget is spent on managing information. The study also noted that healthcare professionals spend a quarter of their time finding, storing and using information needed in care. A more recent study investigating communication links in an obstetric unit [13] has found that on average, clinicians spend 70 per cent of their time on accessing patient data by using medical or nursing notes, computers, telephone and/or internal mail.

Accurate, credible information, available when and where it is needed, is a core component of evidence-based healthcare (EBH). Governing current UK service provision, EBH has transformed the care process 'away from basing decisions on opinions, past prac-

tice or precedent towards making more use of science, research and evidence to guide decision making' [14]. Access to the right information, under the right safeguards, at the right place and time, using the right ways and means [15] is essential for an EBH service seeking to evaluate care-input and health-gains outcome. Access to such information will enable an unbiased judgement of health-care service effectiveness and promote the dissemination of best clinical practice.

Understanding the clinical information management process is the essence of what healthcare informatics may be considered to be, namely: '[T]he rational study of the way we think about patients, and the way that treatments are defined, selected and evolved. It is the study of how medical knowledge is created, shaped, shared and applied' [16]. Purves [9] has used an informatics framework to describe a person-based medical consultation process comprising:

- The identification of problems (Data)
- The classification of those problems (Information)
- The understanding of their impact on the individual (Knowledge)
- The resolution or amelioration of the problem to the patient's satisfaction while helping the individual to cope with and manage their illness
- All within the bounds of medical capabilities and society resource limitations. (Wisdom)

In this dynamic, human centred interaction, data are transformed into meaningful information in the pursuit of an understanding of a 'problem'. This information is then turned into sound knowledge with which to ameliorate problems and to gain 'wisdom' beyond the specific case. This process is developed through the construction of a patient/provider partnership while being affected throughout by system constraints, for example through access to resources. The use of informatics terms to describe a medical encounter assists in the understanding of the cardinal role of computers in current healthcare provision process.

COMPUTERS IN CARE

The computer is now placed at the heart of clinical information systems, accounting for the major part of the information flow in healthcare and providing an effective means of acquiring, manipulating, storing and presenting data to clinicians and their patients. The

effective use of an information system within the human centred clinical encounter could serve to enhance the subprocesses of obtaining data, processing information and applying new knowledge to maximize health gains. Yet in most primary care consultations, the computer is used only at the end of the information flow process for acute or repeat prescribing [17].

A recent study has demonstrated that use of computers is low despite clinicians' unmet information needs and that the inherent potential of computers is not yet being fully exploited [18]. Richards *et al.* [19] claim that despite the fact that most general practitioners (GPs) have a computer at their desk, it is undervalued as its use is seen as taking up important consultation time and does not appear to contribute to patient satisfaction. However, a study undertaken to quantify the increase in the length of a consultation by using computers has found it to be in the region of 48–90 seconds with marked benefits in certain preventative tasks [20].

One suggested explanation for the reluctance to use computers in consultation is that information technology (IT) is being pushed by technology champions who focus on the efficiency or the robustness of the technology with little attempt to gain its acceptance by end users. Consequently, many clinicians feel they have been excluded from the design stages of a system that is supposed to address their clinical information needs. They therefore see IT as a monitoring tool deployed by management to ensure efficiency and effectiveness while undermining clinical autonomy. Such a perception by clinicians of managers as having no clear understanding of their needs, has a negative impact on the desire for ownership by the grassroots workforce of any information system.

Purves [9] has suggested that in order to progress the informatics-enhanced clinical encounter beyond 'basic' data-information-knowledge management tasks, computers must be embraced as an equal partner within a 'triadic clinical consultation' process. In such a process the computer is used to address both clinicians' and patients' information needs and to provide an effective medium for building a therapeutic relationship, rather than being perceived as a barrier to effective communication. This advanced system will include not only a full EPR, but also a decision-support mechanism which may be able to process specific clinical information. Such a system could flag healthcare needs and suggest or recommend an appropriate course of action. The ultimate decision as to whether to accept responsibility and thus accountability for a course of action will remain with the human partners working

in collaboration to achieve agreed healthcare goals.

TELECARE: A NEED-LED APPROACH

The concerns that a political agenda for a modern healthcare service may force clinicians to adopt their practice to accommodate a 'given' technology, were fuelled by a recent debate in the House of Commons. The government confirmed that from 2000 all health improvement programmes and associated strategies will need to demonstrate that telemedicine and telecare options have been considered [21].

The term telehealth is often used alongside or interchangeably with telemedicine and telecare. The difference is that telemedicine facilitates remote patient care in an institutional setting, whereas telecare refers to services that provide care for people away from institutions, typically in their own homes. telehealth is perhaps a more encompassing term as it represents more accurately the current philosophy of a multi-disciplinary healthcare [22].

Telehealth applications include a number of heterogeneous technologies and services that cut across boundaries between different professions, including care providers, health administrators, social services and information systems [23]. To date most telehealth projects have been evaluated only in terms of structure and function rather than the acceptability of such technology to professionals and patients [24]. Williams *et al.* [25] states that 'Telecare technologies have tended to be developed in relative isolation, without proper consideration to needs of the individual clients and of the relevant care providers'.

Needs assessment (NA) is seen as a method of identifying and describing specific areas of needs, discovering factors contributing to the perpetuation of needs, and devising criteria for plans to address such needs [26]. Needs assessment is population specific yet described as systematically focused, empirically based and outcome orientated [27]. Three levels of need were identified by Witkin and Altschuld [26] namely:

1. Primary level: those individuals who would be the direct recipients or receivers of services.
2. Secondary level: those individuals or groups who deliver services to those in the primary level.
3. Tertiary level: those who are responsible for resources and inputs into solutions.

Witkin and Altschuld [26] claim that NA should always be directed towards the primary level, as this level is the very reason for the existence of the other levels.

Siden [28] states that NA is a critical part of a telehealth design, yet noted that very little work has been published on NA being used in the development of telehealth systems. Doolittle and Cook [29] recommended that developers of a telemedicine service assess the clinical, economic and technical needs of such service. In contrast, the World Organization of Family Doctors [30] emphasized the role of local NA and the elicitation of future needs of the community when implementing telehealth systems. It is therefore suggested that a telehealth NA may be appropriately conducted by directly engaging local stakeholders, to establish their needs and how these can be met.

However, Sixsmith and Sixsmith [31] warn about the potential danger in assuming that by engaging subjects in research they will be able and willing to talk about their needs, requirements and preferences. They argue that some people may not be aware of their needs or are aware of a problem without having the perception of a corresponding need. They also warn that subjects may not be the best judges of what they need as they may lack the appropriate understanding, knowledge or information about possible solutions to their needs. There may also be others who are unwilling, for whatever reason, to talk about their needs or have no confidence in the ability of the services (or technology) to address their needs and thus feel that expressing them is a waste of time.

To overcome such problems, a semi-structured interview framework was constructed to engage individuals in a telehealth needs assessment. Four main themes or 'interview seeds' of healthcare, technology, home and communication were used as the core elements around which the interview was based. To elaborate on these themes and elicit needs, interviewees were asked to describe their daily routine from the time they got up through to the time they went to sleep and when/if they woke up during the night. While discussing each daily activity around a 24-hour cycle and identifying current difficulties in performing such activities, subjects were asked to voice their thoughts, feelings or concerns about introducing a specific technology to accompany an activity. The perceived impact of such innovation on their lives was noted and recorded.

The technology discussed included current and future communications technology, environmental/security sensors, lifestyle monitor-

ing and, to some degree, physiological/medical instruments enabling remote care. The interview format was used to seek subjects' views and perspectives in their own terms and framework of understanding rather than project or attempt to generalize findings to a wider population. The interview data were then used as the basis of a survey tool to enable a greater input of interested potential users (patients/clients) in Tayside and West Lothian in Scotland.

The telecare approach, explored with subjects, is but one alternative to current service delivery. This approach, conceived through a critical evaluation of developments in Smart Home technology, suggests that while Smart Homes may be appropriate for a small number of individuals, the need for the majority is for access to simpler, flexible systems that can evolve through time as their need changes [32]. In this context, and despite the liberating attributes offered by current home technology, the use of care technology appears to present a dramatic compromise in the self-identity of an older person. However, if moving out of their current home is seen as a 'bad alternative', the use of telecare may be considered even if it means losing some of the control experienced in their own home. It is also suggested that people who are currently living in sheltered housing, those who have taken an active step to addressing their needs, will be more willing to accept deployment of technology including lifestyle monitoring in their home [33].

THE TECHNOLOGY PRESCRIPTION

The qualitative study referred to above identified a need to re-engineer or modify the current service delivery system so that all involved are engaged in a needs-led, technology-enhanced, care provision in the home. However, there is a paradox in that people who see the value of using care technology want a device that could be activated in an emergency situation, and then many state they will not use it or wear it when feeling well. People also tend to object to a device that can monitor any decline over an extended period of time and alert a care provider to a potential need or risk. Moreover, people see the transfer of data captured by a non-emergency device as inappropriate if done without their explicit consent.

A study of the role of technology in the care in the community of people with dementia [34], has found that if technology is intro-

duced at the very early stages of the disease onset, users were still able to remember how to use their community alarm in an emergency. On the other hand, the study found that when faced with changes to their environment, a person with dementia became very suspicious, leading them to experience concerns and aggression. An extract from one interview with an 82-year-old lady illustrate this point:

Subject: Yes, I don't think I would like that [bed sensor]. As I say circumstances can change. If I was poorly or losing my mind maybe I would like something like that. I would not want people to know exactly what I am doing but as far as I am concerned I am OK. I don't want that, it is an intrusion so I don't want it.

Interviewer: You don't want it just in case?

S: No! No! I don't want it just in case.

I: If I was to tell you that if you were to become forgetful it will be more difficult to introduce such sensor. You would say no because of your mental state. It is better for people to say 'I am well now I will have it now before...'

S: No! I will leave it to someone close to me and if they realise that I wasn't... I would agree with them. I would go with them then. If I find myself losing my mind and doing things I shouldn't do, which it is right what you say, I would say to my son or my sister, I think I want some help here and I will have something like that.

I: Other than these people, who would be a person that can advise you in this matter?

S: I think it will be the doctor.

Prior to accepting a proactive technology that has the capacity to monitor deterioration of a person's health status, identified here as the cardinal factor for a need to move out of the home, an expressed need that indicates that a self-awareness of failing health must be noted. Adopting a preventative, 'just in case', approach must foster a change strategy which promotes acceptance through:

- Introducing the benefits of such technology to an everyday task in the home by using a well accepted medium.
- Technology being introduced by a care professional who has a responsibility for health as well as for ill health and who is trusted as a competent care provider.

It is therefore suggested that telecare could become an effective approach to home-based long-term care if presented as an added element to healthcare needs assessment and as an extension of the care equipment component within a healthcare plan. A proposed means of mapping user need to technological provision

is to generate what is here referred to as a 'technology prescription'. Such a prescription could, for instance, take the form of a suggestion to enhance security requiring full costs to be borne by the patient, or suggest an alternative to care with costs paid by the state.

The technology prescription will have the same basic role as that of the current drug prescription, but instead of being presented to a pharmacist it would be presented, or sent electronically, to an approved technology provider prior to installation in the users' home environment.

To be effective it is believed that the prescribed technology needs to be supported by appropriate national and international standards together with a mechanism to monitor the provision and use of the technology. This will serve to ensure system safety and robustness and will allow the technology purchasers to feedback to and influence the development of future technology.

It is further believed that enabling people to experience the benefits of a 'prescribed home-technology' will not only ensure that devices are used and deployed effectively, but may also promote willingness and even 'compliance' with the new regime being prescribed by a healthcare professional. An integrated and versatile solution must be sought where the same care technology infrastructure is also used as a shared platform for healthcare communications and co-ordination. Recording unmet needs by a home technology assessor and enabling technology developers to have access to such record will ensure that future telecare technology is developed to address the needs of clients.

The use of care professionals such as a district nursing sister as assessors will reassure clients through the knowledge that these assessors have a statutory duty to adopt an advocacy role while assessing healthcare needs. Such a role will ensure that clients are informed about the consequence of relinquishing control over information transfers in emergency and non-emergency events.

Information held on the EPR and available to the assessor prior to the home visit may be used to support the needs evaluation process. The EPR may indicate that a particular individual has a confirmed diagnosis resulting in a flag being set to indicate, for example, to the person carrying out the evaluation that the patient may have difficulties with the gripping and manipulation of objects. Using an electronic decision support system, interfaced to the EPR record, and an approved database of telecare products, technologies may be suggested to the assessor for incorporation into the technology prescrip-

tion, including details of cost, contraindications, availability and recorded benefits. By joint consultation with the patient and their carer an appropriate technology can be found that will enhance the care and quality of life the individual can expect while remaining at home.

The healthcare professionals carrying out the assessment will be responsible for filtering information, comparing their assessment of needs with the suggested technical solution and recording unmet need. The final decision as to whether to issue a prescription may well lie with the responsibility of the GP.

CONCLUSION

The paper has considered the link between the use of informatics and the provision of home based technologies for patient support and care as part of a telehealth strategy within the NHS. A key feature of this provision is the means by which user need is identified and linked to the availability of relevant technologies and the concept of a technology prescription is suggested as the means of providing this link.

In order to develop the concept of the Technology Prescription a number of detailed research issues have been identified and these form the basis of continuing research in this area.

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